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A COMPARISON OF FOUR STRATEGIES FOR TEACHING A SMALL FOREIGN-LANGUAGE VOCABULARY

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We compared the effects of tact training, listener training, and two types of intraverbal training on 2 children's acquisition of foreign-language tact, listener, and intraverbal relations. The children received all four types of training simultaneously with different stimulus sets. Native–foreign intraverbal training presented the greatest difficulty with acquisition for both children. All types of training generated increases in correct responding on tests for emergent relations, and some emerged to criterion. However, no type of training resulted in criterion-level performance on all relations.

DESCRIPTORS: emergent relations, foreign-language instruction, intraverbals, listener behavior, tacts

The age at which foreign-language instruction should begin has been debated (Agulló, 2006). However, a push for an early start to vocabulary building is currently evident in commercially available toys and videos for preschool-aged children (e.g., Dora the Explorer). Behaviorally, the acquisition of a foreign-language vocabulary word may be described as the acquisition of at least four novel relations: (a) The learner vocalizes the foreign word when presented with its referent (e.g., a visual stimulus), (b) the learner orients towards the referent when presented with its foreign name, and (c) the learner vocalizes a foreign word given its native-language equivalent or (d) vice versa. The first relation may be referred to as a *tact*, the second as a *listener* relation, and the third and fourth as *intraverbals* (Skinner, 1957). Skinner's analysis suggests that the four relations are functionally independent of one another. However, because each relation shares a stimulus or a response with an existing native-language tact or listener relation, current behavior-analytic accounts of language appear to predict that the training of one novel relation could result in the emergence of the others given a relevant prior history (Hayes, Barnes-Holmes, & Roche, 2001; Horne & Lowe, 1996).

Empirically, it appears that by preschool age, children tend to readily acquire listener relations as a result of vocal tact training (e.g., Lowe, Horne, Harris, & Randle, 2002), but may acquire vocal tacts as a result of listener training less reliably (e.g., Horne, Lowe, & Randle, 2004). Studies on teaching intraverbal categorization to typically developing preschoolers (Miguel, Petursdottir, & Carr, 2005; Petursdottir, Carr, Lechago, & Almason, 2008) have not found reliable emergence of intraverbals following tact or listener training or of tacts and listener relations following intraverbal training. By contrast, Petursdottir, Olafsdottir, and Aradottir (2008) found that the training of foreign-language tacts or listener relations could generate accurate native–foreign and foreign–native intraverbals. However, the emergent intraverbals were not necessarily bidirectional. Similar findings were reported by Pérez-González, Herszlikowicz, and Williams (2008) when all trained and tested relations were intraverbal. In both studies, there were possible indications that intraverbals might be most likely to emerge if they shared stimuli or responses with trained

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relations. Because these findings suggest that outcomes of initial training may vary depending on which relation is trained, we conducted a preliminary within-subject comparison of the effects of tact, listener, and intraverbal training on acquisition rate and emergence of untrained foreign-language relations.

METHOD

Participants, Setting, and Materials

Dianna and Kamilla were 5 years old, had no known language or developmental delays, and spoke Icelandic as a native language. Sessions were conducted at their preschool. Visual stimuli consisted of 15 laminated cards (10 cm by 8 cm) with color drawings of familiar items (animals, toys, and vehicles). Prior to the experiment, the participants could name (i.e., tact) each item in their native language and vocally imitate its name in the target foreign language (Italian). The stimuli were divided into five three-stimulus sets. One set was used in each of four training conditions, whereas the fifth set served as a control during pre- and posttests.

Procedure

Baseline and training. A multiple baseline design across participants was used to assess the effects of training on the trained repertoires, and an adapted alternating treatments design was used to compare acquisition rates across conditions.

Each baseline and training session consisted of 48 trials presented in a variable sequence, with four trials corresponding to each of the 12 stimuli used in training. The experimenter conducted listener trials with one three-stimulus set, tact trials with a second set, native–foreign intraverbal (NFI) trials with a third, and foreign–native intraverbal (FNI) trials with a fourth. The assignment of stimulus sets to conditions varied across participants. The experimenter initiated a listener trial by placing three stimulus cards on a table in front of the child and delivering the Icelandic equivalent of the instruction ''Point to [foreign word].'' In a tact trial, the experimenter held up a stimulus card and asked the Icelandic equivalent of ''What is this in Italian?'' In an NFI trial, the experimenter asked the Icelandic equivalent of ''What is [native-language word] in Italian?'' On an FNI trial, the experimenter asked the Icelandic equivalent of ''What does [foreign word] mean?'' No visual stimuli were used in NFI and FNI trials.

In baseline, the experimenter delivered no consequences for correct and incorrect responses. During training, the experimenter praised correct responses and modeled a correct response following an incorrect response. Training continued until there were 10 of 12 correct responses on each set in two consecutive sessions (Dianna) or a total of 10 training sessions were completed (Kamilla).

Pre- and posttests. Pre- and posttests of tacts, listener relations, FNI relations, and NFI relations were conducted immediately prior to baseline and following training. The listener test targeted the nine stimuli from the tact training, NFI training and FNI training sets, and the three stimuli from the control set. Each stimulus was presented four times during the test, for a total of 12 trials per set. The tact, NFI, and FNI tests similarly targeted all stimuli that were not included in tact, NFI, and FNI training, respectively. Stimulus presentation and instructions were identical to baseline and training trials, and no consequences were delivered following correct or incorrect responses. The passing criterion was 10 of 12 correct responses on a particular stimulus set.

Data collection. The experimenter recorded correct and incorrect responses manually. A correct response was recorded when the child selected the target stimulus (listener trials) or emitted the target vocalization (all other trials) within 10 s of trial initiation. Otherwise, an incorrect response was recorded. A second observer independently recorded data on over 25% of all sessions for each child. The observers

scored an agreement for each trial on which both recorded a correct or incorrect response. The two observers agreed on 100% of all trials.

RESULTS AND DISCUSSION

Dianna required six training sessions to meet the acquisition criterion on all sets, whereas Kamilla did not reach criterion on the FNI or NFI sets within the 10 sessions that were available for training (Figure 1). Both participants' acquisition was slowest in the NFI condition.

Pre- and posttest data are shown in Figure 2. Listener training resulted in increases in correct tact and intraverbal responding for both participants. However, neither participant met the posttest passing criterion for any of these relations. This finding is consistent with prior findings of variable effects of listener training or auditory-visual conditional discrimination training on children's vocal responding (e.g., Horne et al., 2004; Miguel et al., 2005; Petursdottir, Carr, Lechago, & Almason, 2008). When tested with the tact training set, both children passed listener tests. Dianna also passed the NFI but not the FNI test, whereas Kamilla did not pass either intraverbal test. Dianna passed the listener test on both of the intraverbal training sets. On the NFI set, she also passed the FNI test but did not pass the tact test. On the FNI set, she had no correct responses on either the tact or the NFI test. Kamilla passed the listener test only on the NFI set and did not pass any tests on the FNI set; however, her performance might have differed had she been allowed to complete training on these sets.

In sum, the training of a single relation was typically followed by some increases in correct responses on tests for untrained relations, the only exception being Dianna's tact and NFI performance following FNI training. Listener relations in most cases emerged to criterion as a result of tact or intraverbal training. In addition, Dianna acquired intraverbal relations to criterion as a result of tact and NFI training. In no case, however, did the training of a single relation suffice to bring about the emergence of all untrained relations to criterion. Dianna's performance on the tact and the FNI sets may be consistent with the notion that vocal relations might be most likely to emerge if they share a novel stimulus or novel response with trained relations (Pérez-González et al., 2008; Petursdottir, Olafsdottir, & Aradottir, 2008); however, her performance on the NFI set is inconsistent with that interpretation. Kamilla's data must be interpreted with caution because she did not complete FNI or NFI training, which was a primary limitation of the pretest–posttest evaluation. However, her data do not suggest that the different training conditions were differentially likely to generate untrained relations. Further investigation is warranted.

A second limitation of the pretest–posttest evaluation is that tests of listener relations differed from tests of vocal relations in that the three-choice task provided an opportunity for correct responding by chance. Therefore, although the data in Figure 2 might seem to suggest that listener relations were more likely than vocal relations to emerge as a result of any type of training, it is important to note that this pattern could be due to chance inflation of correct responding on listener tests.

One possible interpretation of the findings is that the failure of training to establish all four relations reflects their functional independence of one another (Skinner, 1957). A second interpretation might appeal to failure of relevant covert responses to occur during training or testing (Horne & Lowe, 1996). A third interpretation (Hayes et al., 2001) might be that the tests for emergent relations did not include effective contextual cues for deriving those relations, due to an insufficient history of exemplar training involving the cues that were present on test trials (e.g., the instructions). This interpretation has been employed in studies in which initial training of motor

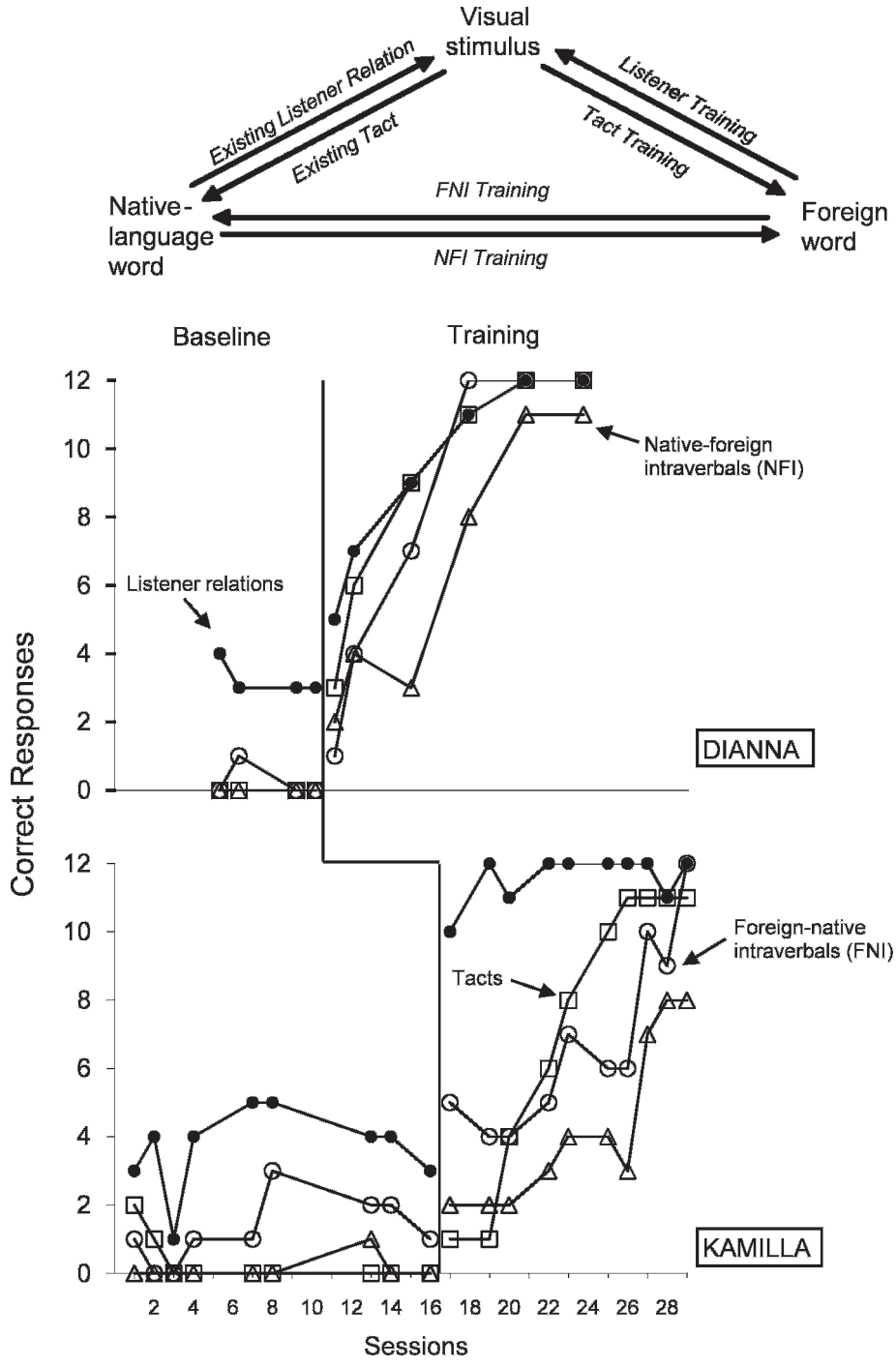

Figure 1. Acquisition data for Dianna (top) and Kamilla (bottom). The diagram above the data graphs displays the existing native-language relations and the trained foreign-language relations.

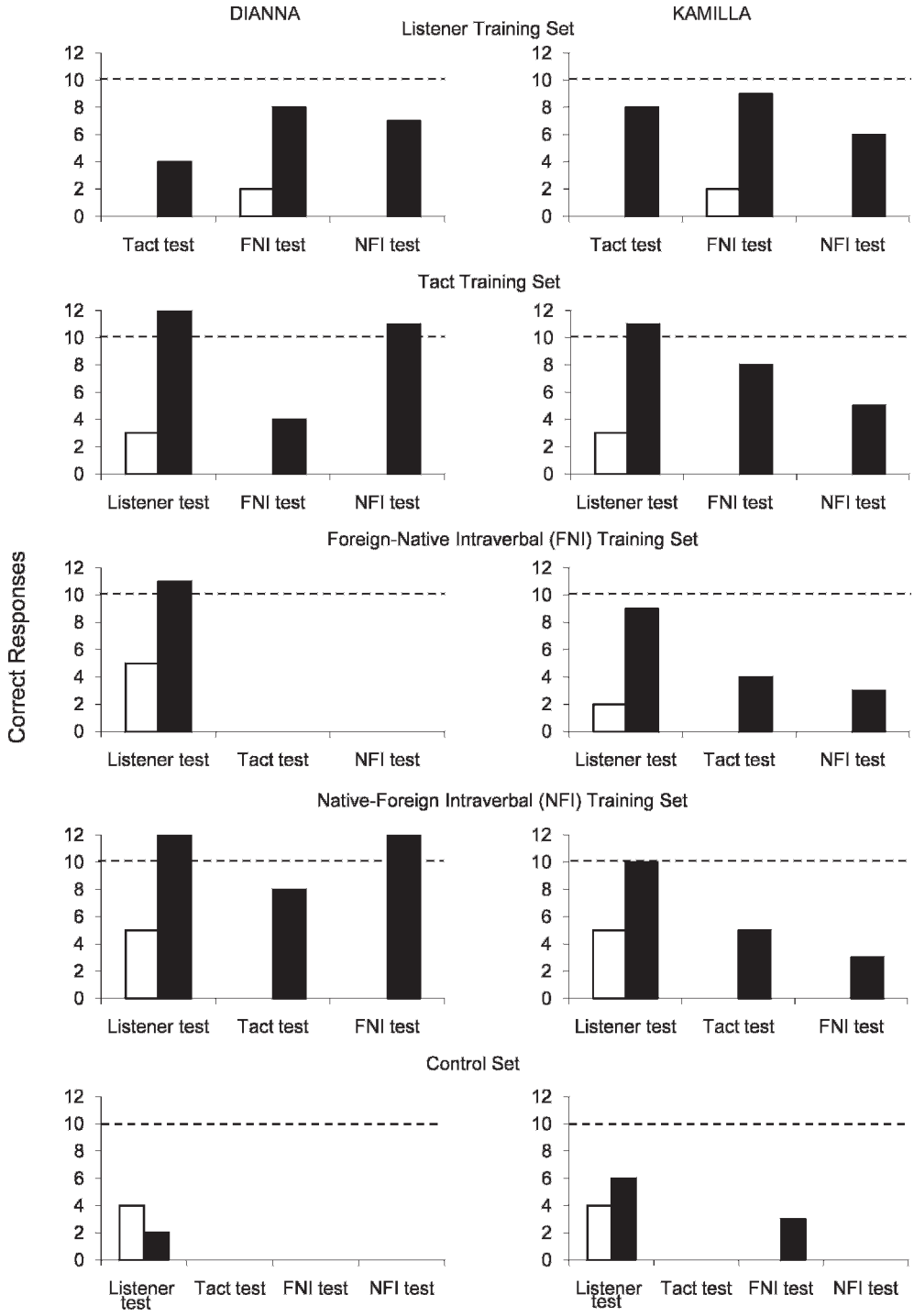

Figure 2. Pre- and posttest data for Dianna (left) and Kamilla (right). Dashed lines represent the passing criterion.

responses to visual stimuli (tacts) or selection of visual stimuli after watching an experimenter perform an action (listener responses) failed to establish the full range of potential emergent relations among children who were of similar ages as the children in the present study (e.g., Gómez, López, Baños Martín, Barnes-Holmes, & Barnes-Holmes, 2007). In those studies, training involving multiple exemplars eventually led to the emergence of untrained relations. Similar effects of multiple-exemplar training have been demonstrated on vocal responding of children with developmental delays (e.g., Pérez-González, García-Asenjo, Williams, & Carnerero, 2007). However, other types of interventions have also been reported that may remediate failures to acquire one verbal operant as a result of the training of another; for example, the training of autoclitic frames (Hernandez, Hanley, Ingvarsson, & Tiger, 2007) and training responses to elements of instructions presented on test trials (Pérez-González et al., 2008).

In practical terms, the overall results for Dianna, as well as Kamilla's data on tact and listener training, suggest that when teaching foreign-language vocabulary words to young children, training one relation to criterion may not always result in the emergence of all other relevant relations in the absence of intervention. Future research might investigate the effects of multiple-exemplar training or other interventions on emergent foreign-language repertoires.

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